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10/681,615	10/08/2003	Masashi Goto	2204-10-3	7280

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EXAMINER	
MCDONALD, RODNEY GLENN	
ART UNIT	**PAPER NUMBER**
1753	

DATE MAILED: 04/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/681,615	GOTO ET AL.	
	Examiner	Art Unit	
	Rodney G. McDonald	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 is indefinite because "plate-like" is unclear.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 10 is rejected under 35 U.S.C. 102(b) as being anticipated by Noguchi (Japan 2001-203099).

Regarding claim 10, Noguchi teaches a plasma processing chamber 30 as seen in Fig. 3. (See Fig. 3) In Fig. 3 is shown a chamber 30 defining at least one opening (not labeled) and constructed for retaining a generated plasma. A dielectric member 31 positioned to sealing cover the at least one opening and having for forming a generally rectangular shape. At least one waveguide 12 having a generally rectangular cross section (See Figures 3, 4(a)-(c)) to oppose the dielectric member 31. The rectangular wave guide defines a homogenous volume. A microwave oscillator (not shown) provides microwaves in the direction of arrow in Fig. 3. At least one hole 13 having a generally rectangular cross section and formed in the at least one waveguide 12 and

positioned to oppose the dielectric member. One side of the at least one hole is parallel to one side of the dielectric member 31. (See Abstract; See Machine translation 0019-0024; Machine translation 0032-0037; Figure 3, 4(a)-4(c))

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi (Japan 2001-203099) in view of Akimoto (U.S. Pat. 6,189,481).

Regarding claim 1, Noguchi teaches a plasma processing chamber 30 as seen in Fig. 3. (See Fig. 3) In Fig. 3 is shown a chamber 30 defining at least one opening (not labeled) and constructed for retaining a generated plasma. A dielectric member 31 positioned to sealingly cover the at least one opening and having for forming a generally

rectangular shape. At least one waveguide 12 having a generally rectangular cross section (See Figures 3, 4(a)-(c)) to oppose the dielectric member 31. The rectangular wave guide defines a homogenous volume. A microwave oscillator (not shown) provides microwaves in the direction of arrow in Fig. 3. At least one hole 13 having a generally rectangular cross section and formed in the at least one waveguide 12 and positioned to oppose the dielectric member. One side of the at least one hole is parallel to one side of the dielectric member 31. (See Abstract; See Machine translation 0019-0024; Machine translation 0032-0037; Figure 3, 4(a)-4(c))

The differences between Noguchi and the present claims are adjusting the holes size to adjust the opening area of the holes (Claim 1), having larger hole areas than other areas is not discussed (Claim 2), a hole having the largest hole area located on the terminal end side of the wave guide is not discussed (Claim 3), one of the holes being located near the periphery of the dielectric member is not discussed (Claim 5), wherein one of the holes has long sides which are parallel to one side of the dielectric member (Claim 6), the hole area of the hole on the side wall surface of the chamber being made the largest with the hole area adjusting means is not discussed (Claim 7), where the hole area adjusting means is made with a metal-plate like portion by reciprocating the plate-like portion is not discussed. (Claim 8)

Regarding the adjusting of the holes size to adjust the opening area of the holes (Claim 1), Akimoto '481 teach providing shutters for slots, which radiate electromagnetic waves. The slots can be opened or closed selectively by respective shutters 62. Operating members 64 are respectively connected to the shutters 62. In this

configuration shutters 62, i.e., the areas of the radiation ports can be controlled at the outside of the chamber independently of each other. For example, assume that a wafer or similar semiconductor substrate 18 should have the central part thereof treated to a greater degree than the peripheral part. Then, the radiation ports 32 facing the central part of the substrate 18 will be opened wider than the other radiation ports 32 facing the peripheral part. (Column 3 lines 45-48)

Regarding having larger hole areas than other areas (Claim 2), Akimoto '481 teach that the holes can be selectively controlled such that there are larger areas for example in the center and smaller hole areas at the periphery. (Column 3 lines 45-48)

Regarding a hole having the largest hole area located on the terminal end side of the wave guide (Claim 3), since Akimoto '481 teach that the holes can be selectively controlled in area it is believed that the apparatus can have a hole with the largest area on the terminal end side of the wave guide. (Column 3 lines 45-48)

Regarding where one of the holes is located near the periphery of the dielectric member (Claim 5), Akimoto '481 teach locating holes near the periphery of the dielectric member. (See Fig. 3B; Figure 4; Column 3 lines 45-48)

Regarding wherein one of the holes has long sides which are parallel to one side of the dielectric member (Claim 6), Akimoto et al. teach in Fig. 3B having holes with long sides which can be parallel to one side of the dielectric member. (See Fig. 3B)

Regarding the hole area of the hole on the side wall surface of the chamber being made the largest with the hole area adjusting means (Claim 7), since Akimoto et al. recognize that the central holes can be made large than the peripheral holes it

follows that the apparatus could operate such that the central holes are made smaller than the peripheral holes thus leading to holes on the side wall surface of the chamber being largest. (Column 3 lines 45-53)

Regarding where the hole area adjusting means is made with a metal-plate like portion by reciprocating the plate-like portion (Claim 8), Akimoto et al. teach the hole area adjusting means being plate-like (i.e. shutter) and can be selectively moved (i.e. reciprocated). From Fig. 3A the shutters appear to be metal. (See Akimoto et al. Column 3 lines 45-58; Fig. 3A)

The motivation for controlling the holes size of the microwave radiation holes with a selective member is that it allows for control of plasma distribution. (See abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Noguchi et al. by utilizing hole area means to control the area of the electromagnetic radiating holes as taught by Akimoto '481 because it allows for control of plasma distribution.

Claim 4 rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi in view of Akimoto '481 as applied to claims 1-3 and 5-8 above, and further in view of Matsumoto et al. (U.S. Pat. 6,290,807).

The difference not yet discussed is the use of plural waveguides.

Matsumoto et al. teach utilizing plural waveguides for introducing microwaves. (Column 11 lines 31-52)

The motivation for utilizing plural waveguides is that it will prevent a decrease in the energy in different areas of the chamber. (Column 11 lines 47-52)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized plural waveguides as taught by Matsumoto et al. because it allows for preventing a decrease in energy in different areas of the chamber.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi (Japan 2001-203099) in view of Akimoto (U.S. Pat. 5,415,719).

Regarding claim 9, Noguchi teaches a plasma processing chamber 30 as seen in Fig. 3. (See Fig. 3) In Fig. 3 is shown a chamber 30 defining at least one opening (not labeled) and constructed for retaining a generated plasma. A dielectric member 31 positioned to sealing cover the at least one opening and having for forming a generally rectangular shape. At least one waveguide 12 having a generally rectangular cross section (See Figures 3, 4(a)-(c)) to oppose the dielectric member 31. The rectangular wave guide defines a homogenous volume. A microwave oscillator (not shown) provides microwaves in the direction of arrow in Fig. 3. At least one hole 13 having a generally rectangular cross section and formed in the at least one waveguide 12 and positioned to oppose the dielectric member. One side of the at least one hole is parallel to one side of the dielectric member 31. (See Abstract; See Machine translation 0019-0024; Machine translation 0032-0037; Figure 3, 4(a)-4(c))

The difference between Noguchi and the present claims is where the area of the hole on the side of the chamber wall surface is made larger than those of the other holes.

Akimoto '719 teach in Fig. 9 providing holes having a larger area near the chamber wall surfaces than those of the other holes in the center. The holes are made in a plate 14' as a microwave regulation rectangular plate 23. (See Fig. 9; Column 4 lines 66-68; Column 5 lines 1-6)

The motivation for having larger area openings near the wall than at the center is that is allows for production of a more uniform plasma. (Column 5 lines 5-6)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Noguchi by utilizing larger area openings near the wall than at the center as taught by Akimoto because it allows for production of a more uniform plasma.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi (Japan 2001-203099) in view of Riblet (U.S. Pat. 2,632,809).

Noguchi is discussed above and all is as applies above. (See Noguchi discussed above)

The difference between Noguchi and the present claims is the locations of the long sides of the rectangular holes.

Riblet teach locating the slits in a waveguide such that some of the slits are oriented such that their long sides are located parallel to the long sides of the waveguide and that some of the slits have their long sides located parallel to the short side of the waveguide. (See Riblet Figs. 1-3)

The motivation for providing particular orientation of the rectangular holes is that it allows for a device that operates over a wide range of frequencies. (Column 1 lines 6-10)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Noguchi by utilizing a particular orientation of the rectangular holes as taught by Riblet because it allows for a device that operates over a wide range of frequencies.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi (Japan 2001-203099) in view of Tokuda et al. (U.S. Pat. 5,134,965).

Noguchi is discussed above and all is as applies above. (See Noguchi discussed above)

The difference between Noguchi and the present claims is that the farther holes from the microwave oscillator are larger than the holes closer to the microwave oscillator is not discussed.

Tokuda et al. teach in Fig. 18 that the slot closer to the microwave oscillator should be smaller than the slots further away from the microwave oscillator. (Column 17 lines 49-63)

The motivation for controlling the slot size is that it improves the degree of radiation of the microwave. (Column 17 lines 49-63)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Noguchi by utilizing controlling the slot

size to be smaller near the microwave generator as taught by Tokuda et al. because it allows for improving the degree of microwave radiation.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi (Japan 2001-203099) in view of Ishii et al. (U.S. Pat. 5,698,036).

Noguchi is discussed above and all is as applies above. (See Noguchi discussed above)

The difference between Noguchi and the present claims is that the interval of the slots being equal to half of the wavelength of the microwave is not discussed.

Ishii et al. teach that the length between slots in a microwave generator should be spaced about 5 to 50% o the guide wavelength. (Column 6 lines 1-10)

The motivation for spacing the slots at half the wavelength of the microwave is that it allows for generating a low pressure and high density plasma. (Column 2 lines 44-47)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Noguchi by utilizing spacing for the slots to be half the length of the microwave as taught by Ishii et al. because it allows for generating a low pressure and high density plasma.

Response to Arguments

Applicant's arguments filed 2-21-06 have been fully considered but they are not persuasive.

Applicant argues that Mabuchi, which was previously applied in the prior office action, fails to teach a waveguide as claimed in Applicant's claims. More specifically

Mabuchi fails to teach the Applicant's amended limitation of the waveguide having a homogenous internal volume. In order to meet this limitation the Examiner has cited Noguchi (Japan 2001-203099) to teach a waveguide having a homogenous internal volume. Specifically Noguchi et al. as discussed above teach a plasma processing chamber 30 as seen in Fig. 3 having a chamber 30 defining at least one opening (not labeled) and constructed for retaining a generated plasma; a dielectric member 31 positioned to sealing cover the at least one opening and having for forming a generally rectangular shape; at least one waveguide 12 having a generally rectangular cross section (See Figures 3, 4(a)-(c)) to oppose the dielectric member 31; the rectangular wave guide defines a homogenous volume; a microwave oscillator (not shown) providing microwaves in the direction of arrow in Fig. 3; at least one hole 13 having a generally rectangular cross section and formed in the at least one waveguide 12 and positioned to oppose the dielectric member; and one side of the at least one hole is parallel to one side of the dielectric member 31. Noguchi clearly teaches the homogenous internal volume of the waveguide. This directly compares to Applicant's embodiment shown for Example in Fig. 1b of Applicant's specification, which shows the homogenous internal volume of a waveguide.

The Examiner appreciates Applicant's discussion of Japan 08-111297 of record and it does not teach the geometry required by Applicant's claims. However Noguchi discussed above teaches the geometry required by Applicant and is believed to be applicable to the claims. Japan 08-111297 will not be discussed further.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
April 20, 2006